UCRL-JC-125586 Abs

Simulation of the Deformation of a Submerged Cylinder due to an Underwater Explosion using ALE Techniques.

Richard Couch and Douglas Faux
Lawrence Livermore National Laboratory
P.O. Box 808, L-170
Livermore, CA 94551
Phone - 510-422-1655
FAX - 510-422-3389

Abstract

Underwater explosions and their effect on structures provide a complex simulation challenge. The disparity in time and distance scales between the initial detonation of explosive and the subsequent bubble expansion and collapse place significant demands on the modeling software in terms of accuracy and efficiency. In addition, the transfer of energy between the fluid and the structure can require a tight coupling of the fluid and the structural representations. The problem presented here involves the prediction of the deformed shape of a submerged metal cylinder after loading from an underwater explosive. Simulations were performed on ALE3D, a 3D, finite element code which combines the capabilities to perform fluid dynamics and structural mechanics within the same mesh. Multifluid ALE techniques are used to facilitate the treatment of the fluid regions in problems of this type. Comparisons between simulations and experimental data will be made. The methods used will be described and the sensitivity of the results to the methods will be discussed.

Work performed under the auspices of the U.S. Department of Energy by the Lawrence Livermore National Laboratory under contract No. W-7405-ENG-48.